Space Weather Forecast

Issued on Monday, 25 December 2023 at 01:11 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of Moderate class flares throughout. Slight chance of glancing coronal mass ejection impacts day 3-4 (27-28 Dec), and G1 Minor geomagnetic storm intervals.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Moderate activity with three Moderate class flares observed. Peak flare was from the largest of the seven sunspot regions in the southwest disc, at 24/1118 UTC, which also produced one of the other M-flares at 24/1649 UTC. The other was observed from over the southeast horizon at 24/1951 UTC. This region is comprised of two well-separated leader and trailer spots, but with very small mixed polarity spots ahead of the main leader resulting in some slight complexification. Along with the interaction with a nearby filament (plasma held together in a line by the Suns magnetic field), this likely resulted in the flare activity that was observed. Otherwise one of the spots in the north-centre disc exhibited some small growth, before stabilising as a small group. All other spots remained small and simple

There are a number of filaments on the disc, and a few of this erupted to produce coronal mass ejections (CMEs), two of which were notable for potentially having Earth-directed components. This including a large eruption off the northwest disc after 24/1100 UTC and a smaller eruption off the southwest at 24/1430 UTC. A couple of other CMEs were observed, however these were off the Earth-Sun line.

Solar Wind / Geomagnetic Activity: Solar winds were background to slightly elevated, and while an observed weak enhancement may have originated in a weak coronal hole, this is inconclusive with no clear observed source. Observed solar wind speeds were background to slightly elevated. Total Interplanetary Magnetic Field (IMF), was Weak to Moderate while the north-south component was weak and variable, but favoured a negative (southward) orientation at first. Phi angle was mainly positive (away from the Sun). Geomagnetic activity eased from mainly Unsettled to mainly Quiet (Kp 1-3).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained at background despite the Moderate-flare activity. No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is forecast with an ongoing chance of isolated Moderate flares.

Solar Wind / Geomagnetic Activity: There are two CMEs with the potential for Earth-directed components. The first from the NW filament eruption on 24 Dec, is expected to mainly miss, but with a glancing impact possible on day 3 (27 Dec). The second is from smaller the SW filament eruption on 24 Dec, with a glancing impact possible on day 4 (28 Dec). Both are low confidence. Otherwise, no notable enhancements are expected with solar winds persisting at background to slightly elevated throughout. Geomagnetic activity is expected to be mainly Quiet, but with a chance for spells of Unsettled to Active, with a slight chance G1 Minor Storm intervals, from any

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CME glances day 3 or day 4 (27-28 Dec).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is forecast to remain at background, although there is a slight chance of this rising towards the S1 Minor Radiation Storm threshold should any further notable flares occur.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	20	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	55	50	45
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	5	5	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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